



# electronics update

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airproducts



*Air Products Gases Group Vice President Art Katsaros presents the 2004 Chairman's Award for Excellence to S.Y. Lee, left, and Y.S. Kwak, right.*

### chairman's award goes to Korean business leaders

Soo Yon Lee, president of Korea Industrial Gases (KIG), and Young Shin Kwak, vice president of Hanyang Technologies, have won Air Products' 2004 Chairman's Award for Excellence, the company's highest honor.

The award recognizes Lee and Kwak for their decade-long effort to build Samsung Electronics Company into a franchise global account. In those 10 years Air Products' annual business with Samsung has increased. Today, Samsung is the company's second-largest Electronics Division account and our largest account in Asia.

Lee and Kwak led teams that developed innovative supply solutions to deliver high-quality products and services. Lee developed the Samsung strategy and key customer relationships, and assured that Air Products/KIG's performance met Samsung's agreements with the company.

Kwak provided entry into the equipment and services business, and facilitated the incorporation of U.S. design philosophies into Korean practice. He was also instrumental in helping Air Products win a major contract for Samsung's Austin, Texas plant.

In announcing the award to the winners, Air Products' Chairman John Jones said they had distinguished themselves on many levels. These include leadership and vision, customer focus, teamwork, risk-taking, and diversity of perspective to effect global solutions. He also made note of the fact that Lee and Kwak are the first employees from our Asian businesses to win the award.

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### Air Products commissions second ASU to serve world's most advanced flat panel fab

Air Products recently commissioned an air separation unit (ASU) and liquefier at Samsung Electronics' newest and also the world's most advanced thin-film transistor/liquid crystal display (TFT-LCD) facility in Tangjung, Korea. To support this project, the company also will begin construction on a second ASU facility at the Tangjung site.

The Samsung Tangjung factory is the first Generation 7 (Gen. 7) facility of its kind, and the largest TFT-LCD manufacturing facility in the world.

It requires large amounts of bulk gases and electronics gases, and will consume from five to eight times the amount of nitrogen that a typical semiconductor fab consumes. The same factor applies to NF<sub>3</sub> requirements.

Air Products, being awarded the long term contracts earlier, is supplying the factory with nitrogen, oxygen, argon, NF<sub>3</sub>, ammonia, and silane through its Bulk Specialty Gases System (BSGS). Future requirements for hydrogen and helium are also being accommodated.

With this contract, Air Products has sold more than 250 BSGS systems to customers throughout the world.

"Samsung Electronics is our long-term customer and partner. We are honored to once again play a role in one of their progressive efforts. The successful commissioning of



*Air Products is a key supplier to Samsung Electronics' new Gen. 7 fab at Tangjung, Korea. It is the world's most advanced thin-film transistor/liquid crystal display (TFT-LCD) facility.*

the Tangjung ASU and liquefier at its cutting edge Gen. 7 facility is a critical milestone and a key achievement for our global team," said Corning F. Painter, Air Products' regional vice president and general manager, Asia Electronics. "We look forward to our continuing long-term partnership with Samsung Electronics and will continue to meet their growing needs with our solid infrastructure and engineering capabilities."

The second ASU facility that Air Products will build at the Samsung Tangjung site will supplement the current ASU and is tentatively slated for completion in late 2005. Additionally, Air Products has allocated space at the Tangjung site for a planned third ASU plant, to be built at a later time to serve future fabs.

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electronic  
specialty  
gases

## company expands services portfolio

Air Products' global electronics customers are now benefiting from the expanded offerings of the Electronics Services Group, all focused on lowering cost of ownership, minimizing downtime, and extending equipment life.

In addition to the MEGASYS Gas and Chemical Management program, the Electronics Services Group now brings three other key offerings to the global semiconductor industry:

• **Chiller Services:** A comprehensive, fully EPA-compliant program comprised of preventive maintenance, refurbishment, and repair of chillers and heat exchangers. We meet or exceed all industry and equipment manufacturer standards and work on a wide array of models.

• **Legacy Tool Services:** Through this program, Air Products helps extend tool life and reduce maintenance costs as a trusted service partner. We are an authorized OEM provider for parts supply, engineering and technical support, repair service, upgrades, tool moves and installations, and refurbishment.

• **Parts Cleaning:** With the recent purchase of Precision Purification Services in Dallas, Texas, Air Products has extended its offerings to include Parts Cleaning. With service for a wide range of process equipment brands including, Applied Materials, LAM, Novellus, TEL, and Varian, customers can minimize their operations costs by reducing their parts inventory and lowering their part replacement costs.

"We'll continue to invest in this area to strengthen our commitment to providing the most reliable, safe, and efficient services to our electronics customers," Pregent stressed.

In related news, the Gilbert, Arizona, Fab Services facility reported the successful completion of its ISO 9001:2000 Quality Management System audit in early October. Obtaining the ISO 9001 certification is a major step in the continuous improvement of the Gilbert facility's semiconductor equipment and chiller refurbishment businesses. ▲

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Technician Flo Bartoleme reviews test data while repairing a chiller at our Gilbert, Arizona facility.

## EZStrip™ 520 series latest line of etch residue removers

Our ACT® Electronic Chemicals group has launched the EZStrip™ 520 Series, a new line of fluoride-containing etch and ash residue removers to complement its expanding EZStrip product line. The series offers a new solvent platform that provides a wide process latitude and is compatible with both low-k and Copper (Cu) applications.

The EZStrip series of etch residue removers was engineered and introduced to the market in 2003. Since then, Air Products has grown the portfolio to include three separate series: EZStrip™ 1, EZStrip™ 500, and EZStrip™ 520. The product line offers solutions for the complete and economical removal of all forms of processing residues, contaminants, and polymers.

The latest additions to the new series are EZStrip 520 and EZStrip 522, both of which are designed to perform in the advanced semiconductor market and, specifically, memory and logic applications. EZStrip 520 is an etch residue remover that is compatible with Cu and porous low-k materials. EZStrip 520 has shown good material compatibility with thin-film chalcogenide materials used in Phase RAM (PRAM), a next generation of non-volatile memories (NVM).

EZStrip 522 is a more aggressive version of EZStrip 520 and is compatible with dense low-k materials. Designed specifically for single wafer tools, EZStrip 522 fosters good selectivity for the removal of an anti-reflective coating (ARC) and photoresist while protecting the inter-layer dielectric (ILD). ▲

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## ER training group has active summer

Our ESM Emergency Response training group had a busy summer.

The group continued its efforts to help the Fire Department of New York rebuild its Hazmat I unit that was severely affected on 9/11. The team offered a one-day version of the company's usual three-day Specialty Gas Emergency Response course as a basic compressed gas primer for 40 Hazmat-1 members who took the course over a four-day period.

Air Products also refurbished and donated more than \$15,000 of compressed gas emergency response equipment to the unit. As part of this package, a unique capping kit was designed and fabricated to fit over the valve area of a 20-lb. propane cylinder. Lester Gerver, project specialist at our Morrisville, Pa., facility, worked in his spare time at home using scrap material to assemble the kit.

To help the Hazmat 1 team prepare for a busy week with the Republican National Convention and the U.S. Open, Air Products helped to check the inventory and condition of the compressed gas ER equipment on the ER trailers and restocked any missing supplies.

Gas emergency response presentations were also offered at the Center for Chemical Process Safety Conference, Orlando, Florida; the 33rd Multination Safety Conference in Shanghai; and the 2004 Southern California Responsible Care® Conference at San Diego. The latter two events were also hosted by Air Products.

Two day-long safety seminars were also held in Suzhou and Shanghai for fire department members and customers, as well as 15 competitors from seven different gas companies at the session in Shanghai.



Air Products' ER Safety Manager Gene Ngai, left, and Hazmat 1 Battalion Chief Robert Ingram, inventory donated equipment.

The group continued to build on its relationship with Taiwanese government agencies responsible for ER by serving as host for visits of officials from Taiwan to the Emergency Communications Center in Allentown, Pa., and our electronic specialty gases complex at Hometown, Pa., the world's largest such facility. This fall it will provide training in Taichung and the Hsinchu Science Park at the request of the Taiwan government. ▲

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two

Among our latest equipment offerings are the next generation of Absolute Temperature Control Systems (ATCS™)—ATCS Plus—and an extension of our PRISM® high-purity nitrogen (HPN) Systems—the Micro HPN Series offering new, state-of-the-art production and supply technologies.

ATCS systems serve the Electronics Specialty Chemicals market. ATCS Plus is designed to provide reliable and stable temperature control of Air Products' Schumacher line of liquid source chemicals.

Among the features of ATCS Plus is an intuitive and functional interface that can be customized for individual customers. The new unit, engineered by Air Products' Electronics Equipment Solutions group, can be retrofitted to replace any current ATCS, and its modular design makes its easy to install and operate. It also provides expanded temperature control ranging from 10 to 120° C, ultimately improving product uniformity and allowing customers to test a wider variety of precursors.

"The ATCS Plus upgrade is an efficient and practical equipment upgrade to our temperature and flow control product line," said Joe

Stockunas, Air Products general manager of electronics equipment. "We're always looking at innovative solutions that address our customers' evolving equipment needs, and the ATCS Plus upgrade does exactly that by enhancing both the tool and user interfaces. It's also designed to meet more stringent performance requirements and R&D demands."

During the transition to the ATCS Plus, Air Products will continue to accept orders for the original version and provide related service and repair support. Air Products is offering an extended service schedule and a long-term exchange program to help smooth the transition for its customers to the new ATCS.

The new Micro HPN Series product line better serves customers with small nitrogen volume demands by offering a fully automatic and highly flexible on-site nitrogen supply system.

Originally, the PRISM HPN System was designed specifically for customers seeking gaseous nitrogen at a flow rate of up to 3500 Nm<sup>3</sup>/hr. Without sacrificing performance or reliability, this next stage of nitrogen generators can accommodate customers with smaller volume requests down to 200 Nm<sup>3</sup>/hr.

"This latest PRISM system is a direct result of listening to our customers, who asked if it was possible to design a competitive high-purity on-site nitrogen generator that could meet their smaller flow requirements," said John Bakey, commercial manager, Generated Gases. "The Micro HPN Series is a solution that is not only very economical, but also flexible and easy to install."

The Micro HPN Series uses cryogenic distillation technology to separate air into its two principal components: gaseous nitrogen and oxygen. The end oxygen product is eventually released back into the air, while the remaining gaseous nitrogen is purified and supplied to the plant.

Highly skidded and coming packaged in a modular design, the Micro HPN Series is simple to install and significantly decreases any disruption to plant operations. It is also completely unmanned and has the capability for local and remote operation. All PRISM systems are offered along with a customer-focused, customizable portfolio of services that include ongoing operation, maintenance and ownership of the equipment. ▲

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## DA NanoMaterials



### Air Products commissions second ASU

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### DA NanoMaterials reports changes

DuPont Air Products NanoMaterials L.L.C. (DA NanoMaterials), a 50/50 joint venture of DuPont Electronic Technologies and Air Products, announced the creation of its new executive leadership team led by CEO Floyd McClung.

The team will be responsible for setting the strategic direction of the enterprise following the addition of the slurry businesses of the former Ashland Electronic Chemicals Division, contributed by Air Products, and EKC Technologies, contributed by DuPont earlier this year.

The joint venture just completed consolidating its Dublin, Ohio and Hayward, Calif. application laboratories into its expanded facilities at the company's headquarters in Tempe, Ariz. The expanded laboratory in Tempe, along with a current laboratory in Japan, will provide technical support for customer applications; it will also conduct

research and development on new products designed to meet the evolving needs of the semiconductor, wafer polishing, and hard disk industries. To this end, the company has employed over 20 scientists and applications engineers.

DA NanoMaterials was formed in 2000 in a collaborative arrangement that combined DuPont's success in developing and manufacturing colloidal silica sols and particles for electronics applications with Air Products' extensive manufacturing infrastructure, new product development and global supply of electronic gases and chemicals.

The joint venture is headquartered in Tempe, Arizona, where it operates a state-of-the-art applications and formulation laboratory. Customers also have access to the extensive analytical and research capabilities of each parent company. ▲

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The TFT-LCD market has continued to grow more than 30 percent annually, outpacing the growth being experienced in silicon semiconductors. Principally located in Korea and Taiwan, the facilities produce flat panel screens used in television, computer monitors, cell phones, and other electronic devices. Air Products is the market's leading supplier of electronic gases.

In September, following completion of an aggressive timeline (under 12 months from project kickoff to full completion), Air Products' Tangjung team opened the final valves on the ASU equipment supplying Samsung with pipeline oxygen and nitrogen—part of a full range of products and bulk specialty gases systems (nitrogen, oxygen, argon, nitrogen, NF<sub>3</sub>, ammonia, and SiH<sub>4</sub>)—that are under the contract awarded to Korea Industrial Gases (KIG) in July 2003.



Air Products' air separation plant at Samsung's new facility in Tangjung will supply five to eight times the amount of Nitrogen that a typical semiconductor fab consumes.

In related news, Samsung Electronics chose Korea Specialty Gases (KSG) as a strategic supplier under the Samsung Strategic Relationship Management Program.

Samsung launched the SRM program to develop and support its outstanding suppliers who meet the company's global criteria to become long-term strategic suppliers. KSG—our wholly-owned subsidiary in Korea—was selected as an SRM strategic partner for its C<sub>4</sub>F<sub>6</sub> localization project. ▲

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three

The following technical papers were recently approved for publication and/or presentation:

**"Consistent Hydrogen Chloride Purity Delivery Through the Use of a Built-in Cylinder Purifier,"** G. M. Mitchell, V. Vorsa, R. M. Pearlstein, A. J. Lachawiec, K. R. Berger, R. E. Parise, F. E. Hulbert, J. J. Hart, and T. Scullard, *Gases and Technology*, September/October 2004

Contact: langjp@apci.com ▲

technical papers

## news of interest:

### *Gases and Technology* honors AP

*Gases and Technology* magazine recognized Air Products with its 2004 Product Innovation Award at SEMICON® West 2004. The magazine cited our MegaBIP® HCl cylinder delivery technology, which allows the highest-purity hydrogen chloride on the market to be used at unparalleled levels of efficiency—a direct contrast with conventional cylinders, where product purity levels can fluctuate widely. HCl is helping to drive the growing wireless and optical communication semiconductor markets. Use of MegaBIP HCl significantly reduces contamination and oxygen-related atom defects found during portions of the chipmaking process.



Bruce Hargus, right, vice president and general manager, Electronics Sales and Operations, accepts the award from "Gases and Technology" Publisher Bill Burris.

### TMAI supply contract signed

Akzo Nobel Polymer Chemicals, L.L.C. and Air Products have signed a long-term global distribution contract to supply high-purity Trimethylaluminum (TMAI) to customers in North America, Europe, and Asia. The arrangement enhances Air Products' Electronic Specialty Materials (ESM) portfolio by adding another high-k dielectric precursor.

Under the contract, we will leverage our global distribution channels to exclusively market and deliver the product to the silicon-based memory and logic applications industry. Akzo Nobel began supplying Air Products in June and will continue to manufacture TMAI from its Houston, Texas facility. With the exception of Japan, TMAI will be offered globally as part of Air Products' Schumacher branded product lines.

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TMAI is used as a precursor for aluminum oxide deposition, a high-k dielectric film required for advanced memory and logic devices. TMAI is the latest addition to an electronics portfolio that covers the entire silicon semiconductor manufacturing process.

### supplier award announced

Air Products Singapore (APS) was again rated "Best Materials Supplier" by customer Chartered Semiconductor for the period of October 2003 to March 2004. APS was rated Number One material vendor by Chartered for the April to September 2003 period as well. This rating means APS has again outperformed all materials vendors serving Chartered. Among the reasons for the rating was the eRoom set up for Chartered by the company's Asia Electronics team. It's the first in Asia.

### EH&S commitment recognized

The South Korean government recently presented Air Products with an award for its commitment to Environmental Health and Safety. The company's wholly owned subsidiary in Korea—Korea Industrial Gases (KIG)—received the 2004 Environmentally Friendly Award from H. B. Lee, Minister of Commerce, Industry and Energy (MOCIE) during the National Environmental Business Ceremony held in Seoul.

### first white ammonia system in China

On June 10, Air Products' China Electronic operations team started up the first white ammonia (NH<sub>3</sub>) GASGUARD™ Hi-Flow system in China, for customer FangDa, in Shenzhen, Southern China. On June 11, the second NH<sub>3</sub> Hi-Flow system was started up at Podium in Guangzhou. There are also operating systems at Lanbao in Shanghai and San An in Xiamen.

### company rebuilding Pueblo facility

Air Products is rebuilding its nitric acid purification facility in Pueblo, Colo. The upgrade is a result of an accident that damaged the facility earlier this year.

Air Products is a North American leader in the manufacture and supply of this material, bringing to the market the highest purity nitric acid in the industry. Along with nitric acid, a variety of high-purity process chemicals are manufactured at Pueblo, all of which are used to clean impurities or etch new layers of semiconductor chips that eventually wind up in devices such as laptop computers, cell phones, and PDAs.

The construction will not interfere with normal plant operations or with the other product lines manufactured at the facility. The rebuild is scheduled to be completed early in 2005. ▲

### chairman's award goes to Korean business leaders

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"This award recognizes both the strategic significance of our Asian business and the contribution our Asian team is making to our Deliver the Difference strategy," Jones said. "I hope all of our people and partners in Asia understand the importance of the honor and the respect and admiration we have for everyone in Asia who is contributing to our success."

Lee and Kwak received their awards at a dinner in Seoul in September. ▲

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## tell me more

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company information

Air Products is a Fortune 500 company with sales over \$5 billion annually and with major operations in 30 countries around the globe. We are a leading supplier of industrial gases, related equipment and services. Our success in industrial gases has come primarily through the development of new technologies that help our customers reduce their overall costs.